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Commentary

Discussion of "Health Effects of Air Pollution"

by E. D. Palmes*

I wish to point out a close parallelism between the work described by Mary Amdur, particularly that done by herself and her colleagues, and that which was being done during roughly the same period at the Institute. Throughout the history of the Institute, one of the chief concerns has been the health effects of air pollution. I include in the definition of "air pollution" all contamination of the environment by materials that might be inhaled by people. I realize that the term now is almost exclusively applied to community air pollution or the contamination of the air that might be breathed by the population at large, rather than by specific groups within the population. The term, incidentally, came into common use in the U.S. only after 1948, when there was a severe inversion over Donora, PA. The inversion virtually put a lid on the valley, and large quantities of industrial effluents remained in the air of the community for a sufficiently long time to produce a range of health effects, including death, in the population. Thus the anniversary of the term "air pollution" will be remembered, but not celebrated, next year.

Prior to 1948, most of the concern with contaminated air was with the air in the workplace. This and other hazards of the industrial environment were responsible for the founding of the Institute, which started as the Institute of Industrial Medicine. As the name implies, the mission of the Institute was to evaluate and improve the workplace environment so as to prevent industrial diseases. The mission included both research and teaching and a very large part of both efforts was in the area of inhaled materials. Our first director, the late Anthony Lanza, had in his earlier careers established himself as a world authority on the pneumoconioses, mainly silicosis. Our second director, Norton Nelson, and I had worked together during World War II at Fort Knox, KY, and our efforts had been largely directed at protection of tank crews—not from enemy gunfire, but rather from the air inside the tank, which they were required from time to time to breathe for protracted periods. The late David Goldstein, who was in the Department of Preventive Medicine at the time of the Institute's founding, had, and continued to have, broad experience in industrial exposures to a variety of industrial hazards; he was a leading authority on the health effects of airborne lead. In short, all of the earliest staff had experience with, and a deep interest in, air contaminants and their human health effects.

Our interest broadened very considerably over the years to include a large number of nonindustrial areas. This broadening of interest did not, however, diminish our effort in the contaminated air that people breathe. The work in inhalation toxicology was increased many fold, as a matter of fact, but the emphasis shifted very largely to mechanisms of action of classes of materials in order to explain both the local and systemic effects of materials of this class. The classifications might be based, for example, on physical properties, chemical structure, or site of action of the inhaled material.

I think that the work on aerosols, a subject near and dear to the speaker's heart and to ours, furnishes a very good basis on which to demonstrate the parallelism noted above. We shared many common experiences in studying the mechanisms of aerosol access to, and effects on, the respiratory tract. Many of the approaches adopted would have seemed very far afield at the inception of the studies. The speaker, for example, used an ingenious guinea pig model to demonstrate bronchoconstriction in the guinea pig—a very sensitive method for demonstrating otherwise undetectable effects on a very sensitive species. The model was obviously useful for aerosols, gases, or their combinations. We all found that it was necessary to know a great deal more about pulmonary physiology and anatomy to find out what fraction of inhaled aerosols are retained on inhalation and how a number of aerosol parameters influence the site of deposition. Once the aerosol was deposited, it was important to know how long it had to remain in contact with the target tissue in order to produce its effect; this depended on its rate of clearance. These aspects involved extensive study and application of the principles of small particle physics and pulmonary physiology. From the paper presented and from Institute publications, it is obvious that our interest in aerosols continues.

*Department of Agricultural Chemistry and the Environmental Health Sciences Center, Oregon State University, Corvallis, OR 97331.

I realize that, insofar as the Institute personnel are concerned, I mentioned only the very early arrivals on the scene and, unfortunately, time does not permit recognizing the much larger number of individuals who later contributed to the Institute's efforts in this area. I would like to mention in closing, however, that these individuals represented a great variety of backgrounds and fields of specialization. They include physicians, mathematicians, physicists, organic chemists, biochemists, pharmacologists, pathologists, engineers of several varieties, and many styles of biologists. Enlisted in cooperative projects were a number of others, particularly medical specialists, to deal with specific aspects of the work.

Finally, I wish to congratulate my friend, Mary Amdur, on a fine presentation and on her many outstanding contributions to the study of the health effects of air pollutants.